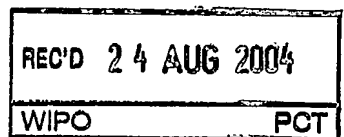




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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004902794 for a patent by CTECH CLOSURES PTY LTD as filed on 26 May 2004.



WITNESS my hand this
Twelfth day of August 2004

J. Billingsley

JULIE BILLINGSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

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Improved tamper evident closure and mould assembly and method of manufacture.

The present invention addresses the issue of closures with tamper evident bands and the competing criteria for a closure to :-

1. be easy to apply to the container whereby the tamper evident band must be able to easily pass over the tamper band retaining bead on the container and also
2. have sufficient engagement between the tamper band and the tamper bead whereby the tamper band is retained by the tamper bead on the container during the process of removing the closure from the container.

We refer to prior art in Drawings in US Patent 5755347 herein re-numbered Fig.1 to Fig. 5 in which there is disclosed a closure 32 with a tamper band 35 whereby the said band is moulded in an extended position shown in FIG.3 and thereafter to facilitate application of the closure to the container, engagement portion 40 is folded into position shown in FIG.1

Also to facilitate application and referring to Fig. 2 engagement portion 40 has segments 43 separated by slots S which serve to reduce the hoop strength of the free edge of engagement portion 40 enabling it to more easily pass over the tamper bead on the container. However, it is necessary to retain sufficient hoop strength to keep the engagement portion 40 in engagement position and of necessity there is interference between engagement portion 40 and the container tamper bead 37.

Referring to FIG 5. Upon rotation to remove the closure, the free end of the tamper band 40 comes into contact with the underside of the container tamper bead 37 and the axial force applied is transmitted through engagement portion 40 to the body of the tamper band 35. The force may be expressed as operating initially on a vector approximately through the line F. however, part of the force will be directed by the geometry and relative positions of the respective features 41, 42, 43 in the direction K which force will encourage the band 35 to deform outwards and thereby moving hinge point 41 outwards and serve to increase the angle of the engagement portion 40 and cause an increase the force acting in the direction K and a decrease in the force acting in the direction L.

Ultimately engagement portion 40 may be forced invert without severing the tamper band from the closure thereby defeating the intended tamper evidence feature of the closure.

The foregoing circumstance may be minimised by making the band 35 of sufficient thickness to resist deformation. However such thickening will make it more difficult to stretch the band over the container tamper bead thereby making the closure harder to apply.

Referring to US patent 6,640,988 which is hereby incorporated in this application there is disclosed in Fig.6. a closure with a tamper band where engagement portion 40 consists of a number of separate elements hinged from a lower end or hinge 41. This arrangement has many advantages over prior art such as US Patent 5755347 in that there is no hoop strength in the engagement portion of the tamper band to be overcome in application of the closure.

However there is still the problem of the force vectors operating through engagement portions 40 to move hinge point 41 outwards and cause the engagement portions 40 to invert before breaking the frangible bridges 38 thereby defeating achievement of tamper evidence.

This following invention is to be manufactured using the mould equipment and method as disclosed in US patent 6,551,093 which is hereby incorporated in this application and modified as disclosed in the following non limiting example of the present invention (shown in Fig. 7A) is to create a closure with a tamper band having more than one engagement portion 40 with a removal force vector angle closer to direction L and to reduce the propensity of the tamper band 35 to deform outwards when removal force is applied to engagement portions 40. This is achieved by locating hinge point 41 closer to the axis of the closure. Such relocation is brought about by thickening the tamper band 35 at the hinge point 41 so that the following advantages are achieved

the force vector angle is reduced causing more of the removal force to operate in the direction L and less to operate in direction K and

thickening the band facilitates resistance to deformation outwards which assists in maintaining the position of hinge point 41 thus maintaining maximum force vector in direction L

the thinner portion of the band above hinge point 41 leaves an area into which the free end of engagement portion 40 can flex when upon application engagement portion 40 passes over the container tamper bead 37.

Referring to comparative drawings Fig. 7A showing the improved closure and Fig 7B showing the Taha version. Whilst the difference is visually subtle -

1. the force vector operating upon removal at hinge point 41 to stretch the band 35 is reduced by about 60% (reduced from about 15 degrees to about 5 degrees) and
2. the increase in hoop strength by thickening the lower portion of band 35 will further contribute to resist stretching of the band upon removal.

Both of these changes will together act to ensure that the hinge point 41 of does not move outwards under stress of removal thus ensuring that the engagement portions 40 are held in place to effect separation of the tamper band from the closure.

In another invention addressing the same issue of improving the operation of the tamper evidence means and more specifically the tamper evident ring on a closure we disclose in Fig. 8 a portion of a tamper evident ring 55 connected by frangible bridges 50 to the closure body (not shown) but having an annular engagement portion of the tamper band 58 which has one or more windows 58B at the hinge line to allow drainage of any liquids spilled during the filling process and one or more gaps or recesses 58A in the free end of the said engagement band 58. This invention is to be manufactured using the mould equipment and method as disclosed in US patent 6,551,093 modified in that the engagement portion of the tamper band 58 is moulded in a position such that the angle 'A' between line A1 extended from and parallel to the inside wall of the tamper band 55 and line A2 extended from and parallel to the outside wall of the annular engagement portion of the tamper band 58 is greater than 0 degrees and less than 45 degrees and preferably 30 degrees.

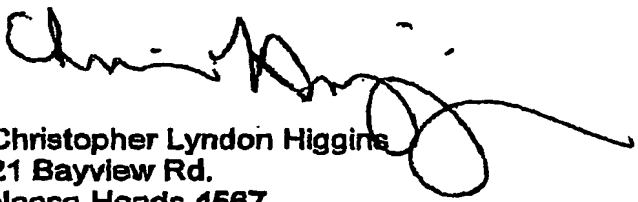

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FIG. 1

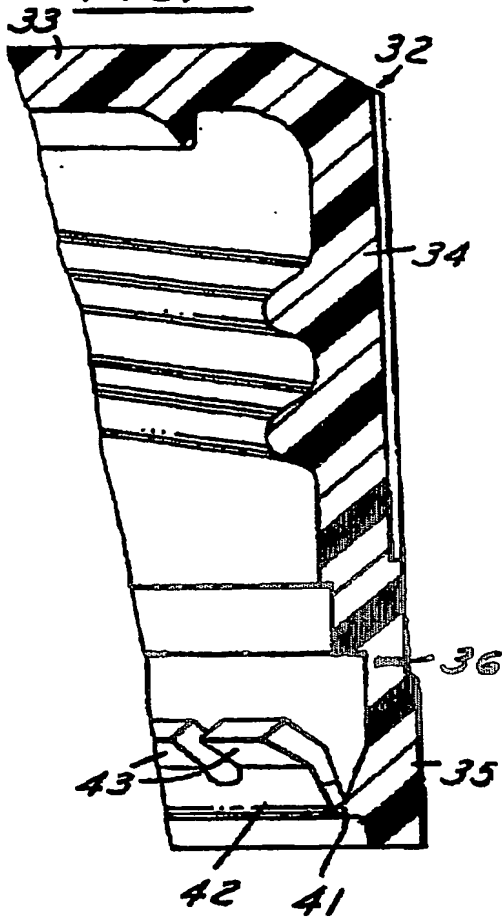


FIG. 2

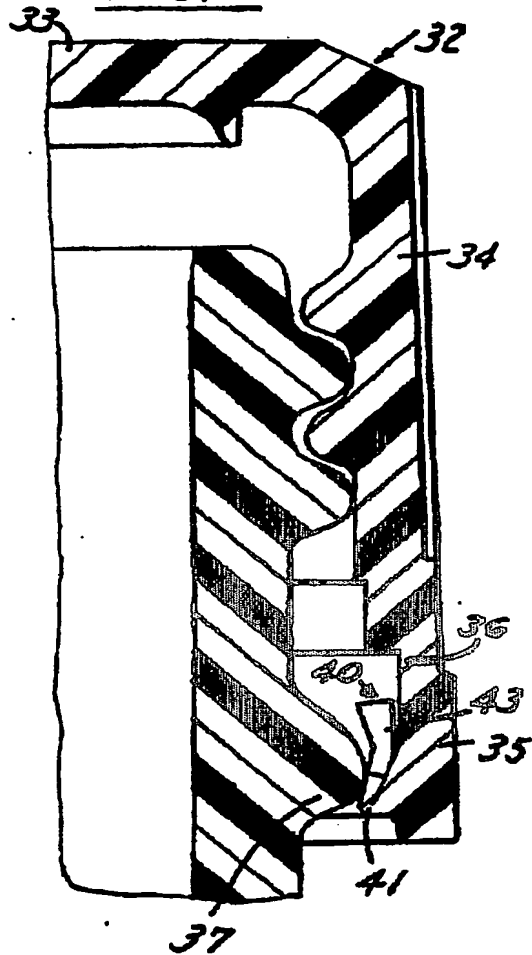


FIG. 3

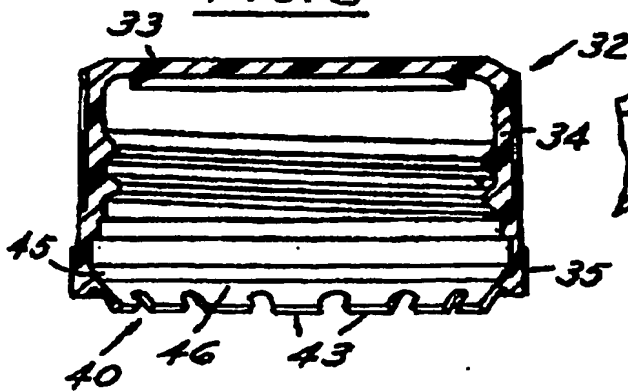
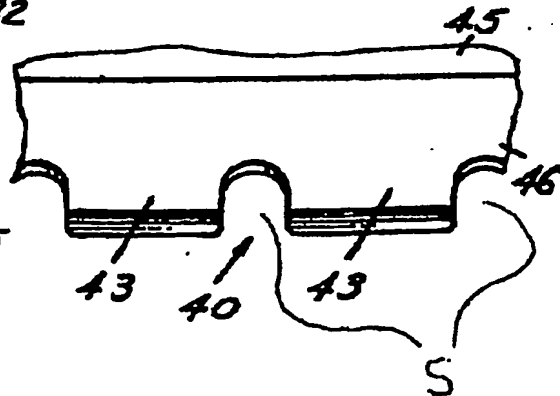
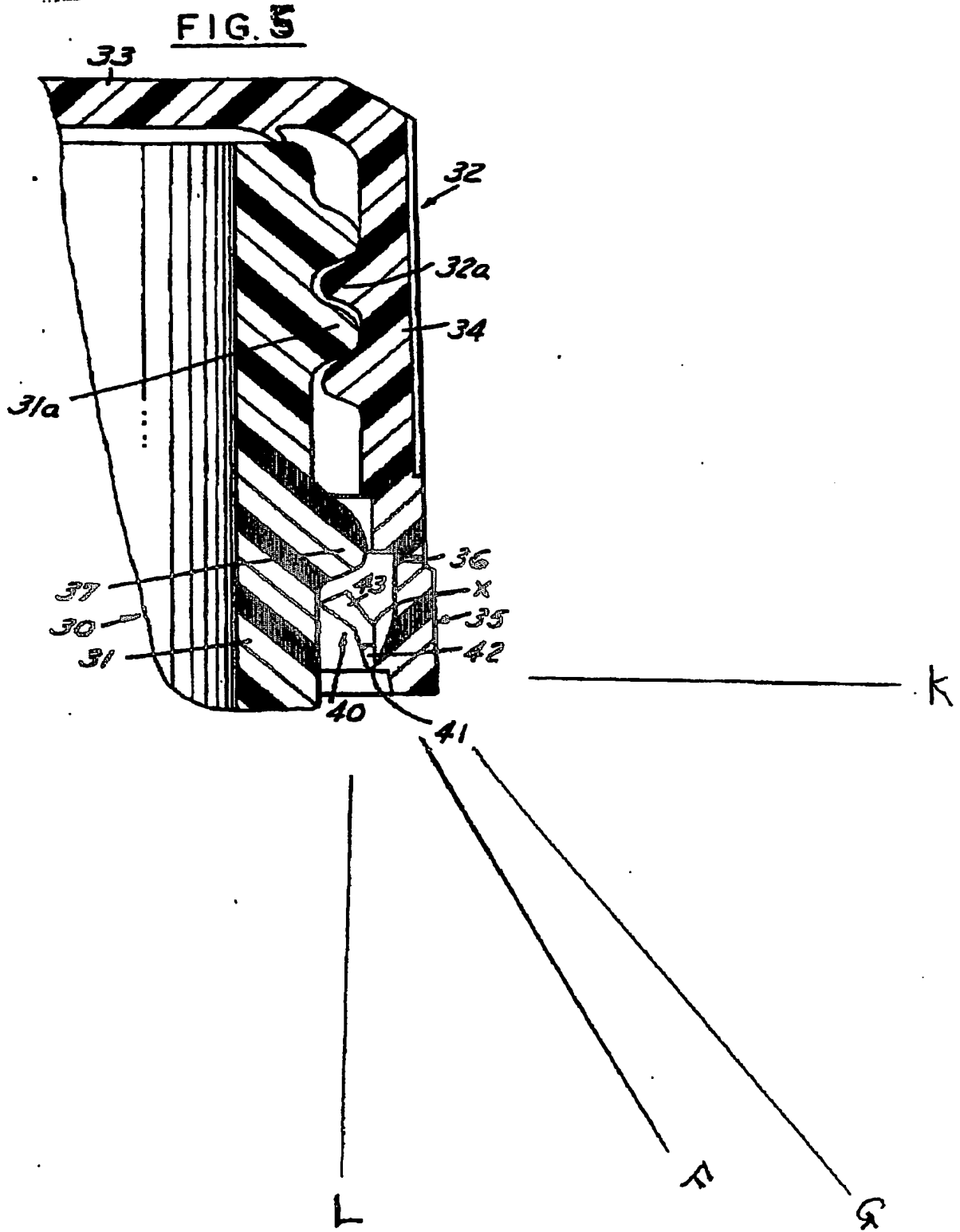


FIG. 4



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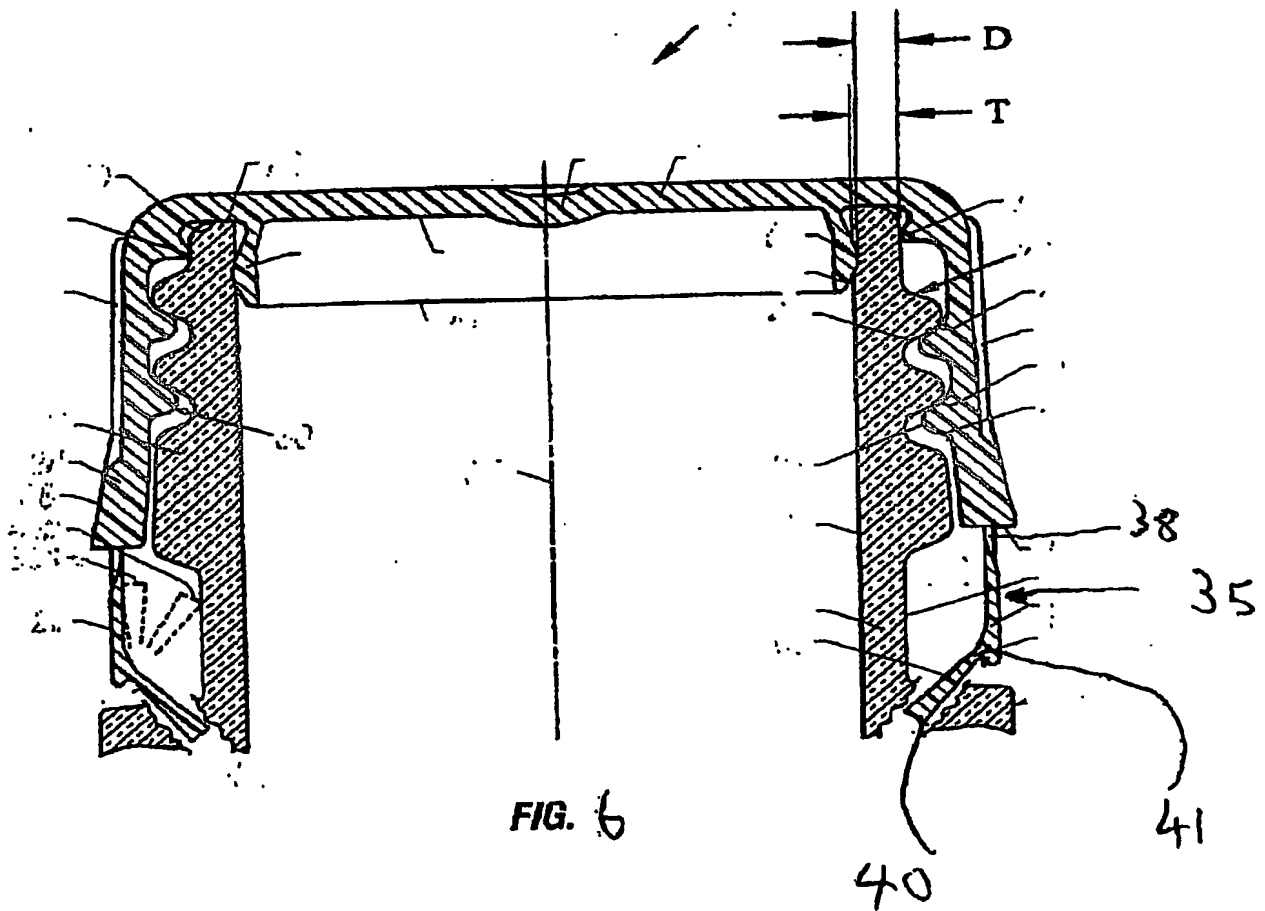
U.S. Patent

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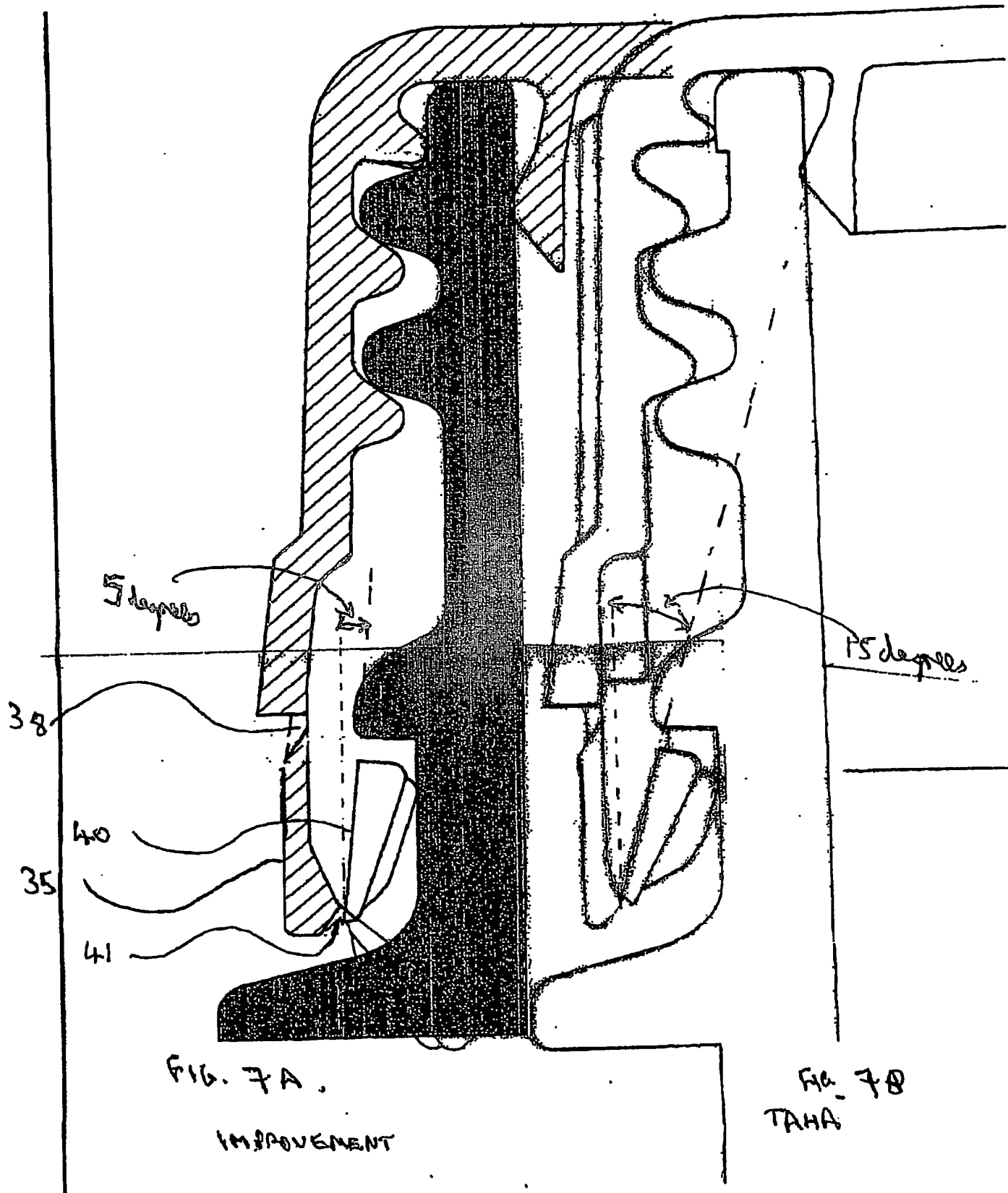
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